

**Amendments to the Claims:**

This listing of claims will replace all prior versions and listings of claims presented in the above-identified application:

1. (currently amended) A system for assaying one or more targets in a sample, comprising:

(a) an assay device having one or more assay sets at least one for each target to be assayed, each of the assay sets comprising at least two electrodes and a recognition moiety immobilized to one or more of the at least two electrodes, the recognition moiety being capable of specific binding to one of the targets;

(b) an electric or electronic module arranged and configured to measure electric conductance between the at least two electrodes of each assay set; and

(c) reagents formulated to deposit a conductive substance onto a complex formed between said recognition moiety and said target, wherein the reagents comprise: (i) a solution comprising nucleation-center forming entities for binding to said target if present in the sample; and (ii) a combination of metal ions and a reducing agent to allow formation of said conductive substance on said entities, and wherein the conductive substance, when deposited onto the complex, forms a conductive bridge between the at least two of the electrodes of a set.

2. (canceled)

3. (previously presented) A system according to Claim 1, wherein said reagents comprise:

(i) one or more reagents to allow deposition and/or formation of said nucleation center-forming entities on a complex formed between said recognition moiety and said target; and

(ii) a combination of metal ions and a reducing agent to allow formation of said conductive substance from said entities.

4. (currently amended) A system according to Claim [[2]] 1, wherein said nucleation-center forming entities are colloid particles.

5. (currently amended) A system according to Claim [[2]] 1, wherein said nucleation-center forming entities are metal complexes, clusters, or complexes and clusters.

6. (original) A system according to Claim 4, wherein said colloid particles are colloid gold particles.

7. (previously presented) A system according to Claim 5, wherein said metal complexes or clusters are gold complexes or gold clusters.

8. (original) A system according to Claim 4, wherein said colloid particles are colloid platinum particles.

9. (previously presented) A system according to Claim 5, wherein said metal complexes or clusters are platinum complexes or platinum clusters.

10. (currently amended) A system for assaying one or more targets in a sample, comprising:

(a) an assay device having one or more assays sets at least one for each target to be assayed, each of the assay sets comprising at least two electrodes and a recognition moiety immobilized to one or more of the at least two electrodes, the recognition moiety being capable of specific binding to one of the targets;

(b) an electric or electronic module for determining electric conductance between the at least two electrodes of each assay set; and

(c) reagents comprising monomers of a non-nucleic acid conducting polymer which deposit onto or bind to a complex formed between said recognition moiety and said target, and for growing a conductive polymer from deposited or bound monomers, such that upon polymerization of the monomers a conducting bridge between the at least two electrodes of a set is formed.

11. (previously presented) A system according to Claim 10, wherein said monomers are monomers of polyaniline.

12. (previously presented) A system according to Claim 10, wherein said one or more targets are one or more nucleic acid sequences.

13. (original) A system according to Claim 12, wherein said recognition moiety is an oligonucleotide having a sequence complementary to at least a portion of sequence of one of said one or more targets.

14. (canceled)

15. (previously presented) A system according to Claim 10, wherein at least two electrodes of the assay set have each of the recognition moieties immobilized thereon, these recognition moieties, being the same or different, bind specifically to the same target.

16. (previously presented) A system according to Claim 10, wherein the recognition moiety is immobilized onto the electrode by means of a linker conjugated or complexed with the recognition moiety and attached by a covalent or non covalent bond, to the electrode.

17. (canceled)

18. (previously presented) A system according to Claim 1, comprising a plurality of assay sets of electrodes.

19. (original) A system according to Claim 18, wherein all assay sets of electrodes are for assaying the same target.

20. (original) A system according to Claim 18, wherein different assay sets of electrodes or different groups of assay sets are for assaying different targets.

21. (original) A system according to Claim 20, for simultaneous determination at different targets in a sample.

22. (previously presented) A system according to Claim 1, when the target is a protein or polypeptide and the recognition moiety is a protein-binding molecule which specifically binds to the target protein.

23. (original) A system according to Claim 22, wherein said recognition moiety is an antibody or antibody fraction comprising at least the antigen-binding domain of the antibody.

24. (previously presented) A method for assaying one or more targets in a sample comprising:

(a) providing an assay device having one or more assay sets at least one for each target to be assayed, each of the assay sets comprising at least two electrodes and a recognition moiety immobilized to one or more of the at least two electrodes, the recognition moiety being capable of specific binding to one of the targets;

(b) contacting said assay device with said sample under conditions permitting binding of targets to specific recognition moieties to form a complex;

(c) contacting said assay device with reagents to deposit a conductive substance onto the complex formed between said recognition moiety and said target, such that the conductive substance deposits onto the complex and forms a conductive bridge between said at least two electrodes;

(d) connecting said at least two electrodes to an electric or electronic module to measure conductance between said at least two electrodes; and

(e) determining conductance between said at least two electrodes, conductance above a threshold conductance indicating the presence of a respective target in the sample.

25. (previously presented) A method for assaying one or more targets in a sample, comprising:

(a) reacting the sample targets with a first reagent solution to bind nucleation center-forming entities to said targets;

(b) providing an assay device having one or more assay sets at least one for each target to be assayed, each of the assay sets comprising at least two electrodes and a recognition moiety immobilized to one or more of the at least two electrodes, the recognition moiety being capable of specific binding to one of the targets;

(c) contacting said assay device with said sample under conditions permitting binding of targets to specific recognition moieties;

(d) contacting said device with a second reagent solution to form a conducting metal substance over said nucleation center-forming entities for a time sufficient to yield a conductive bridge between said at least two electrodes;

(e) connecting said at least two electrodes to an electric or electronic module to measure conductance between said at least two electrodes; and

(f) determining conductance between said at least two electrodes, conductance above a threshold conductance indicating the presence of a respective target in the sample.

26. (previously presented) A method for assaying one or more targets in a sample, comprising:

(a) providing an assay device having one or more assay sets at least one for each target to be assayed, each of the assay sets comprising at least two electrodes and a recognition moiety immobilized to one or more of the at least two electrodes, the recognition moiety being capable of specific binding to one of the targets;

(b) contacting said assay device with said sample under conditions permitting binding of targets to specific recognition moieties;

(c) contacting said device with a first reagent solution comprising monomers of a conductive polymer such that said monomers can bind to complexes formed between the targets and recognition moieties;

(d) treating said device such that said monomers will polymerize to form a conducting polymer, such that upon polymerization of the monomers a conductive bridge between the at least two electrodes of at least one set is formed; and

(e) determining a conductance between said at least two electrodes, conductance above a threshold conductance indicating the presence of a respective target in the sample.

27. (previously presented) A method according to Claim 26, comprising before step (a) reacting the sample with a second reagent solution containing entities which can form nucleation centers for growing therefrom a conductive polymer from said monomers, such that said entities bind to said targets if present in the sample.

28. (previously presented) A method according to Claim 26, comprising after step (a) contacting said assay device with a second reagent solution containing entities which can form nucleation centers for growing therefrom a conductive polymer from said monomers, such that said entities bind to said targets if bound to said recognition moieties.

29. (previously presented) A method according to Claim 24, wherein said targets are nucleic acid sequences and the recognition moieties are oligonucleotides, each of which has a sequence which is complementary to one of the sequences of said targets.

30. (previously presented) A method according to Claim 24, wherein the level of determining conductance serves as a measure of concentration of the target in the sample.

31. (currently amended) A kit for use in assaying one or more targets in a sample, comprising:

(a) an assay device having one or more assay sets at least one for each target to be assayed, each of the assay sets comprising at least two electrodes and a recognition moiety immobilized to one or more of the at least two electrodes, the recognition moiety being capable of specific binding to one of the targets; and

(b) reagents formulated to deposit a conductive substance onto a complex formed between said recognition moiety and said target, wherein the reagents comprise: (i) a solution comprising nucleation-center forming entities for binding to said target if present in the sample; and (ii) a combination of metal ions and a reducing agent to allow formation of said conductive substance on said entities, and wherein the conductive substance, when deposited onto the complex, forms a conductive bridge between the at least two of the electrodes of a set.

32. (canceled)

33. (previously presented) A kit according to Claim 31, where said reagents comprise:

(i) one or more reagents to allow deposition, formation, or deposition and formation of said nucleation-center forming entities on a complex formed between said recognition moiety and said target; and

(ii) a combination of metal ions and a reducing agent to allow growth of said conductive substance on said entities.

34. (currently amended) A kit for use in assaying one or more targets in the sample comprising:

(a) an assay device having one or more assay sets at least one for each target to be assayed, each of the assay sets comprising at least two electrodes and a recognition moiety immobilized to one or more of the at least two electrodes, the recognition moiety being capable of specific binding to one of the targets; and

(b) reagents comprising monomers of a non-nucleic acid conducting polymer which can bind to the target or to a complex formed between said recognition moiety and said target, such that upon polymerization of the monomers a conducting bridge between the at least two electrodes of a set is formed.

35. (currently amended) An electronic device for determining one or more targets in a sample, comprising:

an integrated circuit comprising a first group of  $N_1$  conductors and a second group of  $N_2$  conductors, defining between them  $N_1 \times N_2$  junctions, each such junction being formed with an electronic module comprising two electrodes, each one linked to or defined as an integral portion of one of the conductors, and comprises a diode or non-linear component permitting current flow through the electronic module only in the direction from the first group of conductors to the second group of conductors whereby a current flowing between one conductor of the first group to one conductor of the second group of conductors defines a single junction point between them; each pair of electrodes forming part of an assay set, each assay set having a recognition moiety for binding a target, bound to at least one of the electrodes and reagents formulated to deposit a conductive substance onto a complex formed between said recognition moiety and said target, wherein said reagents comprise: (i) a solution comprising nucleation-center forming entities for binding to said target if present in the sample; and (ii) a combination of metal ions and a reducing agent to allow formation of said conductive substance on said entities.

36. (previously presented) A device according to Claim 35, wherein distance of center of one assay set to a center of an adjacent assay set is 100  $\mu\text{m}$  or less.

37. (currently amended) An electric device for determining one or more targets in a sample comprising:

a microelectronic device having a plurality of layers, with a first group of conductors being defined as stripes in one or more first layers and a second group of conductors being defined as stripes in one or more second layers of the device with each of said second layers being separated from a first layer by a non-conductive substance, electrodes of the device being formed as open ends of the conductors by openings or cut-outs in a vertical direction through the layers;

each pair of electrodes forming part of an assay set, each assay set having a recognition moiety for binding a target bound to at least one of the electrodes and reagents formulated to deposit a conductive substance onto a complex formed between said recognition moiety and said target, wherein said reagents comprise: (i) a solution comprising nucleation-center forming entities for binding to said target if present in the sample; and (ii) a combination of metal ions and a reducing agent to allow formation of said conductive substance on said entities.

38. (previously presented) A system according to Claim 18, wherein the device is an electronic device for determining one or more targets in a sample, comprising:

an integrated circuit comprising the first group of  $N_1$  conductors and a second group of  $N_2$  conductors, defining between them the  $N_1 \times N_2$  junctions, each such junction being formed with an electronic module comprising two electrodes, each one linked to or defined as an integral portion of one of the conductors, and comprises a diode or non-linear component permitting current flow through the electronic module only in the direction from the first group of conductors to the second group of conductors, whereby a current flowing between one conductor of the first group to the one conductor of the second group of conductors defines a single junction point between them; each pair of electrodes forming part of an array set, each array set having a recognition moiety bound to at least one of the electrodes.

39. (previously presented) A method according to Claim 24, wherein said device is an electronic device for determining one or more targets in a sample, comprising:

an integrated circuit comprising the first group of  $N_1$  conductors and a second group of  $N_2$  conductors, defining between them  $N_1 \times N_2$  junctions, each such junction being formed

with an electronic module comprising two electrodes, each one linked to or defined as an integral portion of one of the conductors, and comprises a diode or non-linear component permitting current flow through the electronic module only in the direction from the first group of conductors to the second group of conductors, whereby a current flowing between one conductor of the first group to one conductor of the second group of conductors defines a single junction point between them; each pair of electrodes forming part of an array set, each array set having a recognition moiety bound to at least one of the electrodes.

40. (original) A method according to Claim 39, wherein said device has a plurality of assay sets for each target to be assayed, the method comprising determining the portion of assay sets displaying a conductance above thresholds, out of all assay sets for one target and based on such determination determining concentration of the target in the sample.

41. (original) A method for detecting one or more targets in a sample by multiplexing comprising:

- (i) contacting the electronic device of Claim 35 with the sample under conditions enabling binding of the targets to recognition moieties; and
- (ii) determining conductance in each assay set.

42. (previously presented) A method according to Claim 24, wherein the level of conductance between said at least two electrodes is a measure of the concentration of the target in the sample.

43. (previously presented) A system according to Claim 1, wherein said one or more targets are one or more nucleic acid sequences.

44. (previously presented) A system according to Claim 43, wherein said recognition moiety is an oligonucleotide having a sequence complementary to at least a portion of sequence of one of said one or more targets.

45. (previously presented) A method according to claim 24, further comprising contacting said assay device with a first reagent solution to form nucleation-center forming

entities for depositing onto or binding to complexes formed between a target and a recognition moiety.

46. (previously presented) A kit according to claim 31, wherein said reagents comprise nucleation center-forming entities that deposit or bind to a complex formed between said recognition moiety and said target and for growing a conductive substance from said deposited or bound nucleation center-forming entities.